

SN 08/869,589



IN THE UNITED STATES  
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

In re Application of: Strolle : Docket No.: SAR 12082  
Serial No.: 08/869,589 : Filed: June 5, 1997  
Group Art Unit: 2734 : Examiner: Kevin Bürd

Title: **METHOD AND APPARATUS FOR PERFORMING BANDEDGE  
EQUALIZATION**

BRIEF ON APPEAL

Honorable Commissioner of  
Patents and Trademarks  
Washington, D.C. 20231

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Sir:

The following appeal brief is submitted pursuant to the Notice of Appeal filed on October 4, 2000 and received by the Patent Office on October 6, 2000 in the above-identified application.

REAL PARTY IN INTEREST

The real party in interest is the Sarnoff Corporation.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences that directly affect, or are directly affected by, or have a bearing on the Board's decision in the pending appeal are known to the Appellant, Appellant's legal counsel, or the Assignee.

STATUS OF CLAIMS

Claims 1, 9-10, 12 and 15-16 stand under final rejection, from which rejection this appeal is taken. Claims 2-8 and 13-14 were objected to as depending on a rejected independent claim. Claim 11 has been allowed.

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STATUS OF AMENDMENTS

A first amendment was filed on July 30, 1999 to overcome a first Office Action dated April 23, 1999. In the first Office Action, the Examiner rejected claims 1, 6-8, 9-10, 12 and 15-16, under 35 U.S.C. § 103 and 112. No claims were rejected under 35 U.S.C. § 102. The Examiner allowed claim 11, and identified claims 2-5 and 13-14 as containing allowable subject matter but dependent upon a rejected base claim. In reply to the first Office Action, the Appellant filed a first response with arguments directed to traverse the Examiner's rejections. No changes were made to claims 1-16.

The Examiner responded to Appellant's July 30, 1999 first amendment in a second Office Action dated August 24, 1999. In the second Office Action, the Examiner cited a new reference to reject claims 1, 9-10, 12 and 15-16 under 35 U.S.C. § 103. No claims were rejected under 35 U.S.C. § 102. The status of claims 2-5, 11 and 13-14 remained unchanged. Claims 6-8 were identified as containing allowable subject matter, but these claims were dependent upon a rejected base claim.

A second response was filed on November 23, 1999 to overcome the second Office Action. The second response included arguments directed to traverse the Examiner's rejections in the second Office Action. No changes were made to claims 1-16.

The Examiner responded to Appellant's November 23, 1999 third response in a third Office Action dated February 18, 2000. In the third Office Action, the Examiner cited a new reference to reject claims 1, 9-10, 12 and 15-16 under 35 U.S.C. § 102. Additionally, the Examiner cited another new reference to reject claims 1, 9-10, 12 and 15-16 under 35 U.S.C. § 103. The status of claims 2-8, 11 and 13-14 remained unchanged.

A third response was filed to overcome the third Office Action, on May 5, 2000. The third response included arguments directed to traverse the Examiner's rejections in the third Office Action. No changes were made to claims 1-16.

The Examiner responded to Appellant's May 5, 2000 third response

with a Final Office Action dated July 10, 2000. In the Final Office Action, the Examiner considered Appellant's arguments for claims 1, 9-10, 12 and 15-16, but the Examiner did not find the Appellant's arguments to be persuasive. The Examiner reiterated the rejection of claims 1, 9-10, 12 and 15-16. The status of claims 2-8, 11 and 13-14 remained unchanged.

An Examiner Interview was conducted on August 31, 2000, where the Examiner, the Primary Examiner and Appellant's representative tentatively reached an agreement. However, the Examiner indicated that a review of the references was necessary prior to any final decision. The Examiner restated this position in an Interview Summary mailed September 13, 2000.

An amendment after Final Office Action under 37 C.F.R. § 1.116 was filed on September 7, 2000. The amendment included arguments to traverse the Examiner's 35 U.S.C. § 102 and 103 rejections in the Final Office Action. No changes were made to claims 1-16.

The Examiner responded to Appellant's amendment after Final Office Action with an Advisory Action. In the Advisory Action, the Examiner sustained the rejection of claims 1, 9-10, 12 and 15-16 under 35 U.S.C. § 102, but withdrew the rejection of claims 1, 9-10, 12 and 15-16 under 35 U.S.C. § 103. The status of claims 2-8, 11 and 13-14 remained unchanged as containing allowable subject matter.

### SUMMARY OF INVENTION

The present invention is an apparatus and method for equalizing the bandedges of a broadband signal. Specifically, the apparatus comprises a pre-equalizer, a bandedge filter and a bandedge signal processor. The pre-equalizer adjusts the bandedges of the broadband signal in response to a control signal generated from the bandedge signal processor. For example, if an amplitude at an upper bandedge frequency is larger than the amplitude at a lower bandedge frequency, the pre-equalizer either attenuates the amplitude at the upper bandedge frequency or amplifies the

amplitude at the lower bandedge frequency. Conversely, if the amplitude at the lower bandedge frequency is higher than the amplitude at the upper bandedge frequency, the pre-equalizer either attenuates the amplitude at the lower bandedge frequency or amplifies the amplitude at the upper bandedge frequency.

The bandedge filter extracts a bandedge signal from the broadband signal. An example of the bandedge signal is a double sideband, amplitude modulated signal containing symbol timing information. The bandedge signal processor generates a control signal in response to the bandedge signal. In one embodiment, the bandedge signal processor generates the control signal by determining the difference between the amplitude of the upper and lower bandedges, and low-pass filtering the difference. The control signal is then applied to the pre-equalizer.

The equalizing of the bandedges of a broadband signal allows a bandedge timing recovery circuit to produce substantially jitter-free or stress-free timing signals. Otherwise, if the bandedges of the broadband signal are not compensated, as in prior art, the bandedge timing recovery circuit may no longer produce timing signals in a jitter-free manner.

As suggested in MPEP 1206, the Appellant now reads the broadest appealed claim on the specification and on the drawings. However, it should be understood that the appealed claim may read on other portions of the specification or other figures (FIG. 1) that are not listed below.

In one embodiment of the invention, the apparatus operates as a bandedge equalizer (116). More specifically, the apparatus comprises a pre-equalizer (300, 302) for adjusting the amplitudes of the bandedges of a broadband signal in response to a control signal. (See Appellant's specification, page 5, lines 15-17 and page 6, lines 22-24) The apparatus also comprises a bandedge filter (312, 314), connected to the pre-equalizer, for extracting a bandedge signal from the broadband signal. (See Appellant's specification, page 5, lines 20-31) The apparatus also comprises a bandedge signal processor (315), connected to the bandedge

filter, for generating the control signal in response to the bandedge signal.  
(See Appellant's specification, page 5, line 34 to page 6, line 25)

For the convenience of the Board of Patent Appeals and Interferences, Appellant's claim 1 (one of the broadest independent claims) is presented below in claim format with elements read on FIG. 2 of the drawings, as suggested in MPEP 1206. Claim 1 positively recites (with reference numerals added):

1. Apparatus for equalizing the amplitudes of the bandedges of a broadband signal comprising:
  - a pre-equalizer (300, 302) for adjusting the amplitudes of the bandedges of said broadband signal in response to a control signal;
  - a bandedge filter (312, 314), connected to said pre-equalizer, for extracting a bandedge signal from said broadband signal; and
  - a bandedge signal processor (315), connected to said bandedge filter, for generating said control signal in response to said bandedge signal.

#### ISSUES

A. Whether claims 1, 9-10, 12 and 15-16 are patentable under 35 U.S.C. §102(e) over Norrell et al. (United States Patent No. 5,793,821, issued August 11, 1998).

#### GROUPING OF CLAIMS

The rejected claims have been grouped together in the rejection. Appellant urges that each of the rejected claims stands on its own recitation, the claims being considered to be separately patentable for reasons set forth in more detail infra.

#### THE REFERENCE

The following reference is relied on by the Examiner:

Author	Publication Title or Reference number	Publication Date
Norrell et al.	U.S. Patent No. 5,793,821	August 11, 1998

### BRIEF DESCRIPTION OF THE REFERENCE

Norrell et al. (hereinafter Norrell) teaches an equalized envelope derived timing system to compensate for a differential time delay that occurs between upper and lower bandedges of a received signal. (See Norrell, Abstract and Figure 5) Specifically, Norrell compensates for differential delay distortion at the upper and lower bandedges. (See Norrell, column 7, lines 65-67) To the extent Norrell compensates for the effects of amplitude distortion on the communications channel, Norrell sharply attenuates the energy of a band located between the upper and lower bandedges, but passes the energy near the bandedges to the complex summing node for further processing in the timing system. (See Norrell, Figure 5, items 508, 512 and 514, column 7, line 67 - column 8, line 2, column 8, lines 28-29, and column 9, lines 5-8)

### ARGUMENT

#### THE ISSUES UNDER 35 U.S.C. § 102

It is submitted that a reasonable interpretation of the reference as proposed by the Examiner in the third Office Action and the Final Office Action would not have resulted in the invention recited in the Appellant's claims.

#### A. 35 U.S.C. § 102 - Claim 1.

The Examiner rejected claim 1 in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action as being anticipated by the Norrell et al. reference (United States patent no. 5,793,821, issued August 11, 1998). The rejection is respectfully traversed.

Specifically, the Examiner alleged that:

"Regarding claims 1 and 12, Norrell et al (Norrell) discloses an apparatus of equalizing the amplitudes of a signal (column 7 line 65

to column 8 line 2) comprising:

a timing interpolating filter (figure 5, item 504) for providing samples for the upper and lower bandedge filters (column 8, lines 7-14) and a delay line (figure 5, item 506) which is part of the modem receiver's adaptive equalizer (column 9, lines 34-35) where the delay line is long enough to compensate for the amplitude and delay distortion in general, it is long enough to compensate for the differential delay distortion at a particular pair of frequencies (column 9 lines 43-48);

upper and lower bandedge filters (figure 5, items 508 and 512) which extracts the bandedge signal; and

a signal processor (figure 5, item 518-530 and column 8, lines 50-67) which provides a control signal to the filters to remove noise and interference to compensate for the amplitude distortions."

In terms of the Appellant's invention, the Examiner has equated the items 504 and 506 (the interpolating filter and the delay line) of Norrell et al. (hereinafter Norrell) with Appellant's pre-equalizer. Additionally, the Examiner has equated items 508 and 512 of Norrell with Appellant's bandedge filter, and has equated items 518-530 of Norrell with Appellant's bandedge signal processor.

The Examiner's interpretation of the teachings of Norrell is simply incorrect. The Board's attention is called to the fact that Norrell does not teach a pre-equalizer for adjusting the amplitudes of the bandedges of the broadband signal in response to a control signal, as recited in Appellant's independent claim 1. Specifically, Appellant's claim 1 positively recites:

1. Apparatus for equalizing the amplitudes of the bandedges of a broadband signal comprising:

a pre-equalizer for adjusting the amplitudes of the bandedges of said broadband signal in response to a control signal;

a bandedge filter, connected to said pre-equalizer, for extracting a bandedge signal from said broadband signal; and

a bandedge signal processor, connected to said bandedge filter, for generating said control signal in response to said bandedge signal. (emphasis added)

The Board is directed to the fact that the cited reference, Norrell, fails to teach the first limitation, i.e., pre-equalizer, in claim 1 of Appellant's

invention. For prior art to anticipate under 35 U.S.C. § 102, every element of the claimed invention must be identically disclosed in a single reference. See Corning Glass Works v. Sumitomo Electronic, 9 U.S.P.Q. 2d 1962, 1965 (Fed Cir. 1989). The exclusion of a claimed element, no matter how insubstantial or obvious, from a prior art reference is enough to negate anticipation. See Connell v. Sears, Roebuck & Co., 220 U.S.P.Q. 193, 198 (Fed. Cir. 1983). For the reasons provided below, Norrell clearly fails to identically disclose each and every limitation of claim 1 as required in Corning and Connell.

The Examiner initially alleged, in Paragraph 4 of the third Office Action, that Norrell's "timing interpolating filter (figure 5, item 504) for providing samples for the upper and lower bandedge filters (column 8, lines 7-14)" teaches Appellant's pre-equalizer for adjusting the amplitudes of the bandedges of a broadband signal. The Examiner further alleged, in Paragraph 4 of the Final Office Action, that the timing interpolating filter and "a delay line (figure 5, item 506) which is part of the modem receiver's adaptive equalizer (column 9, lines 34-35) where the delay line is long enough to compensate for the amplitude and delay distortion in general, it is long enough to compensate for the differential delay distortion at a particular pair of frequencies (column 9 lines 43-48)" teaches Appellant's pre-equalizer. The Appellant respectfully disagrees.

Norrell teaches a timing interpolation filter (figure 5, item 504) to generate an output signal at 2 samples per symbol (See Norrell., column 8, lines 5-7). These samples are received at the equalizer delay line of Norrell et al. (figure 5, item 506), which implements a time delay of the samples for the upper band edge filter (UBEF, Norrell, figure 5, item 508) and the lower band edge filter (LBEF, Norrell, figure 5, item 512). As such, the cited sections of Norrell (column 8, lines 7-14, and figure 5, items 504 and 506) merely compensate for differential delay distortion between the upper and lower bandedges. (Also see Norrell, column 7, lines 65-67) Such compensation of time delay differences between upper and lower bandedge



frequencies is totally devoid of any teaching of adjusting amplitudes of bandedges of any signal, much less a broadband signal, as in claim 1 of Appellant's invention.

As an example of compensating for differential delay distortion Norrell considers the situation where the communications channel delays the lower bandedge more than the higher bandedge by 12 sample intervals. (See Norrell, column 8, lines 15-18) To compensate for this delay distortion, the sample delay line (figure 5, item 506) introduces a larger delay to the higher bandedge, such that the time delay is for the lower and upper bandedges are equalized, i.e., no time delay difference between the lower and upper bandedges. (See Norrell, column 8, lines 22-24) As such, the LBEF for the lower bandedge uses the most recent samples, while the UBEF for the upper bandedge uses more delayed samples. (See Norrell, column 8, lines 18-22) For example, the LBEF uses samples  $x(0) - x(8)$  and the UBEF uses samples  $x(12) - x(20)$ , where the larger index represents more delayed samples.

To the extent Norrell compensates for amplitude distortion, the LBEF and the UBEF sharply attenuates the energy at the "midband" or the center of the band between the lower and upper bandedges, because the midband does not contain any timing information. (See Norrell, column 9, lines 5-8) However, Norrell merely passes the energy in regions centered at the lower and upper bandedges to the complex summing node for further processing in the timing system. (See Norrell, column 9, lines 2-5) Thus, Norrell does not teach an adjusting of amplitudes of bandedges of a broadband signal as in claim 1 of Appellant's invention. Moreover, the Examiner had explicitly conceded in Paragraph 2 of the Final Office Action that adjusting the amplitude of bandedges "is not used in" Norrell.

Nonetheless, in Paragraph 4 of the Final Office Action, the Examiner cites to column 9, lines 43-48 of Norrell to argue that the delay line compensates for amplitude distortion. The Examiner further contends, in pages 3 and 4 of the Advisory Action, that a change in the delay of the

bandedges would compensate for the amplitude distortion. Specifically, the Examiner argued "By adjusting this delay value, the amplitude distortion of the signals (including roll-off values) are compensated for." The Examiner suggested that this compensation is equal to adjusting the amplitude of the bandedges. The Appellant respectfully disagrees.

The cited section (Norrell, column 9, lines 43-48) is directed to the amplitude compensation by the LBEF and the UBEF only after the delay line equalizes the delay or compensates for the differences in delay between the lower and upper bandedges. The delay line ensures that the LBEF and the UBEF process a signal having the same delay at the lower and upper bandedges, or no timing distortion between the lower and upper bandedges.

As such, the delay line only compensates for differential delay distortion between the lower and upper bandedges. Once the delay distortion is compensated for, the LBEF and the UBEF performs amplitude compensation by sharply attenuating the region centered between the lower and upper bandedges. As previously discussed in this Section, such compensation of amplitude distortion does not adjust the amplitude of bandedges of a broadband signal as in claim 1 of Appellant's invention.

Additionally, in Paragraph 2 of the Final Office Action, the Examiner contends that "Norrell clearly suggests a step of equalizing for adjusting the amplitude of the bandedges." Specifically, the Examiner cited to column 9, lines 11-15 of Norrell, which states: "This filtering technique is superior to simple amplitude equalization of the channel prior to extraction of the timing envelope because equalization boosts the desired energy at the bandedges, but also boost the unwanted energy near the bandedges." The Appellant respectfully disagrees.

The cited section (Norrell, column 9, lines 11-15) is directed to channel equalization and not the specific adjustment of bandedges of a broadband signal in response to a control signal. Channel equalization generally involves equalization of the entire frequency response and, as such, is not the same as adjusting bandedges. The purpose of the cited

section was to clarify the advantage of sharply attenuating the midband, i.e., the region between the LBEF and the UBEF, in Norrell. Moreover, the cited section is devoid of any teaching of an adjustment of bandedges in response to a control signal, as generated by the bandedge filter and bandedge signal processor in Appellant's invention. Thus, the cited section does not teach the adjusting of amplitudes of the bandedges of a broadband signal as in claim 1 of Appellant's invention.

Since Norrell et al. fails to teach the pre-equalizer in claim 1 of Appellant's invention, the Appellant respectfully submits that independent claim 1 is not anticipated by the teachings of Norrell et al. and, as such, fully satisfies the requirements of 35 U.S.C. § 102 is patentable thereunder. Therefore, the Appellant respectfully submits that the Examiner's rejection of claim 1 is improper under both Corning and Conell.

B. 35 U.S.C. § 102 - Claim 9.

The Examiner has rejected claim 9, in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action, as being anticipated by the Norrell et al. reference. The Appellant respectfully disagrees.

First, claim 9 depends indirectly from claim 1 and recites additional features therefor. Since Norrell et al. does not anticipate Appellant's invention as recited in Appellant's independent claim 1, dependent claim 9 is also not anticipated and is allowable for at least the reasons stated above with respect to independent claim 1.

Second, dependent claim 9 specifically recites the additional limitation wherein "the pre-equalizer attenuates a particular bandedge signal from said broadband signal in response to said control signal." This limitation defines a specific adjustment of a particular bandedge to equalize the amplitudes of the bandedges of a broadband signal.

In contrast, for the same reasons provided in Section A, Norrell fails to teach any adjusting of the amplitudes of the bandedges of a broadband signal, much less the attenuation of a particular bandedge. Thus, Norrell

also fails to anticipate Appellant's invention as claimed in dependent claim 9. Therefore, the Appellant submits that claim 9, as it now stands, fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

C. 35 U.S.C. § 102 - Claim 10.

The Examiner has rejected claim 10, in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action, as being anticipated by the Norrell et al. reference. The Appellant respectfully disagrees.

First, claim 10 depends indirectly from claim 1 and recites additional features therefor. Since Norrell et al. does not anticipate Appellant's invention as recited in Appellant's independent claim 1, dependent claim 10 is also not anticipated and is allowable for at least the reasons stated above with respect to independent claim 1.

Second, dependent claim 10 specifically recites the additional limitation wherein "the pre-equalizer amplifies a particular bandedge signal from said broadband signal in response to said control signal." This limitation also defines a specific adjustment of a particular bandedge to equalize the amplitudes of the bandedges of a broadband signal.

In contrast, for the same reasons provided in Section A, Norrell fails to teach any adjusting of the amplitudes of the bandedges of a broadband signal, much less the amplification of a particular bandedge. Thus, Norrell also fails to anticipate Appellant's invention as claimed in dependent claim 10. Therefore, the Appellant submits that claim 10, as it now stands, fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

D. 35 U.S.C. § 102 - Claim 12.

The Examiner has rejected claim 12, in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action, as being anticipated by the Norrell et al. reference. The Appellant respectfully

disagrees.

Independent claim 12 is a method claim that recites limitations similar to those found in independent apparatus claim 1. Since Norrell et al. does not anticipate Appellant's invention as recited in Appellant's independent apparatus claim 1, independent method claim 12 is also not anticipated and is allowable for at least the reasons stated in Section A.

More specifically, claim 12 recites "method for equalizing the amplitudes of the bandedges of a broadband signal comprising the step of adjusting the amplitudes of the bandedges of a broadband signal in response to a control signal." Additionally, claim 12 recites the steps of "extracting a bandedge signal from said broadband signal" and "generating said control signal in response to said bandedge signal."

For at least the reasons provided in Section A, Norrell fails to teach the adjusting the amplitudes of the bandedges of a broadband signal in response to a control signal. Therefore, the Appellant submits that claim 12, as it now stands, fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

E. 35 U.S.C. § 102 - Claim 15.

The Examiner has rejected claim 15, in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action, as being anticipated by the Norrell et al. reference. The Appellant respectfully disagrees.

First, claim 15 depends indirectly from claim 12 and recites additional features therefor. Since Norrell et al. does not anticipate Appellant's invention as recited in Appellant's independent claim 12, dependent claim 15 is also not anticipated and is allowable for at least the reasons stated above with respect to independent claim 12.

Second, dependent claim 15 is a method claim that equalizes the bandedges of a broadband signal by reciting similar limitations as compared to dependent apparatus claim 9. Since Norrell et al. does not

anticipate Appellant's invention as recited in Appellant's dependent apparatus claim 9, dependent method claim 15 is also not anticipated and is allowable for the same reason as stated above in Section B.

Third, claim 15 specifically recites that the additional limitation "wherein said adjusting step comprises the step of attenuating a particular bandedge of said broadband signal in response to said control signal." For the same reasons provided in Section B, Norrell fails to teach the attenuation of a particular bandedge of a broadband signal. Therefore, the Appellant submits that claim 15, as it now stands, fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

F. 35 U.S.C. § 102 - Claim 16.

The Examiner has rejected claim 16, in Paragraph 4 of the third Office Action and Paragraph 4 of the Final Office Action, as being anticipated by the Norrell reference. The Appellant respectfully disagrees.

First, claim 16 depends directly from claim 12 and recites additional features therefor. Since Norrell does not anticipate Appellant's invention as recited in Appellant's independent claim 12, dependent claim 16 is also not anticipated and is allowable for at least the reasons stated above with respect to independent claim 12.

Second, dependent claim 16 is a method claim that equalizes the bandedges of a broadband signal by reciting similar limitations as compared to dependent apparatus claim 10. Since Norrell does not anticipate Appellant's invention as recited in Appellant's dependent apparatus claim 10, dependent method claim 16 is also not anticipated and is allowable for the same reason as stated above in Section C.

Third, claim 16 specifically recites the additional limitation "wherein said adjusting step comprises the step of amplifying a particular bandedge of said broadband signal in response to said control signal." For the same reasons provided in Section C, Norrell fails to teach the amplifying of a particular bandedge of a broadband signal. Therefore, the Appellant

submits that claim 16, as it now stands, fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

G. Objection to Claims 2-8 and 13-14

The Examiner has objected to claims 2-8 and 13-14, in Paragraph 7 of the third Office Action and Paragraph 7 of the Final Office Action, as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Applicant respectfully disagrees.

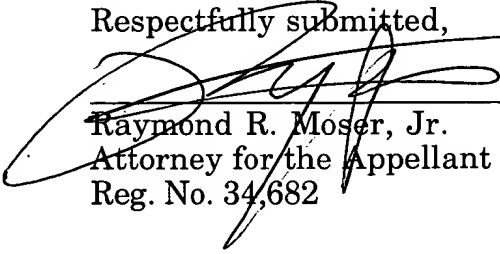
Independent claims 1 and 12 are allowable for the reasons provided in Sections A and D. Thus, the Applicant submits that no amendment is required for dependent claims 2-8 and 13-14.

CONCLUSION

For the reasons advanced above, Appellant respectfully urges that the rejections of claims 1, 9-10, 12 and 15-16 as being anticipated under 35 U.S.C. § 102 are improper. Reversal of the rejections in this appeal is respectfully requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. If necessary, please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 20-0782 and please credit any excess fees to such deposit account.

Respectfully submitted,

  
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12-4-00

CLAIMS UNDER APPEAL IN SN: 08/869,589

- ① Apparatus for equalizing the amplitudes of the bandedges of a broadband signal comprising:
  - a pre-equalizer for adjusting the amplitudes of the bandedges of said broadband signal in response to a control signal;
  - a bandedge filter, connected to said pre-equalizer, for extracting a bandedge signal from said broadband signal; and
  - a bandedge signal processor, connected to said bandedge filter, for generating said control signal in response to said bandedge signal.
2. The apparatus of claim 1 wherein said bandedge signal processor comprises:
  - a first filter for producing a first bandedge signal from said bandedge signal;
  - a second filter for producing a second bandedge signal from said bandedge signal;
  - a first magnitude processor, connected to said first filter, for generating a first magnitude value representing the magnitude of said first bandedge signal; and
  - a second magnitude processor, connected to said second filter, for generating a second magnitude value representing the magnitude of said second bandedge signal.
3. The apparatus of claim 2 wherein said bandedge signal processor further comprises:
  - a subtractor, connected to said first and second magnitude processors, for producing a difference value representing the difference between said first and second magnitude values; and
  - a loop filter, connected to said subtractor, for generating said control signal from said difference value.



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4. The apparatus of claim 2 wherein said first filter is a first Hilbert filter.

5. The apparatus of claim 2 wherein said second filter is a second Hilbert filter.

6. The apparatus of claim 5 wherein said first Hilbert filter has a form

$$\begin{bmatrix} 0 & 1 & 0 \\ -0.5 & 0 & 0.5 \end{bmatrix}.$$

7. The apparatus of claim 5 wherein said second Hilbert filter has a form

$$\begin{bmatrix} 0 & 1 & 0 \\ 0.5 & 0 & -0.5 \end{bmatrix}.$$

8. The apparatus of claim 1 wherein the pre-equalizer has the form

$$\begin{bmatrix} 0 & 1 & 0 \\ \alpha & 0 & -\alpha \end{bmatrix}, \text{ where } \alpha \text{ is a magnitude of the control signal.}$$

9. The apparatus of claim 1 wherein the pre-equalizer attenuates a particular bandedge of said broadband signal in response to said control signal.

10. The apparatus of claim 1 wherein the pre-equalizer amplifies a particular bandedge of said broadband signal in response to said control signal.

12. A method of equalizing the amplitudes of the bandedges of a broadband signal comprising the steps of:

adjusting the amplitudes of the bandedges of said broadband signal in response to a control signal;

extracting a bandedge signal from said broadband signal; and

generating said control signal in response to said bandedge signal.

13. The method of claim 12 wherein said generating step further comprises the steps of:

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producing a first bandedge signal from said bandedge signal;  
producing a second bandedge signal from said bandedge signal;  
generating a first magnitude value representing a magnitude of said first bandedge signal; and  
generating a second magnitude value representing a magnitude of said second bandedge signal.

14. The method of claim 13 wherein said control signal generating step further comprises the steps of:

producing a difference value representing the difference between said first and second magnitude values; and  
generating said control signal from said difference value.

15. The method of claim 12 wherein said adjusting step comprises the step of attenuating a particular bandedge of said broadband signal in response to said control signal.

16. The method of claim 12 wherein said adjusting step comprises the step of amplifying a particular bandedge of said broadband signal in response to said control signal.